



**OPTIMAL BOOLEAN SET OPERATION GENERATION AMONG POLYGON-  
REPRESENTED REGIONS**

**CROSS REFERENCE TO RELATED APPLICATIONS**

[0001] The present application derives priority from Provisional Patent Application No. 60/153,569 filed on 13 September 1999.

**BACKGROUND**

1. Field of the invention

[0002] The present invention relates to Boolean set operations on data sets and, more particularly, to an improved method and software process for Boolean set intersection and set union operations among polygon-represented data sets using a digital computer.

2. Description of related art

[0003] Boolean set operation generation is a foundational computational capability in a wide range of diverse problem domains, including image processing, spatial data analysis, constraint-based reasoning, earth resource evaluation, crop management, market analysis studies, micro-fabrication, mining, weather forecasting, military planning, and utility management. For example, rain forest shrinkage over time can be studied by performing Boolean set intersections between processed earth resource imagery and historical vector-represented geo-spatial map products depicting vegetation. The determination of regions "within 100 miles of Oklahoma City possessing a slope less than 3 degrees where wheat is grown" can be determined by performing Boolean set intersections between a circular region with radius 100 miles about Oklahoma City, a map product depicting slopes, and a land use product depicting agricultural crops. Ground-based target locations for military applications can often be significantly refined by intersecting sensor generated error ellipses with domain features that favor the presence of such vehicles (roads, high mobility regions, and regions that afford cover and concealment), while de-emphasizing regions that do not favor such vehicles (swamps and waterways). Each of these examples relies on Boolean set operation computation among potentially large 2-D